PURDUE
UNIVERSITY

DEPARTMENT OF BIOCHEMISTRY

Regulation of Eukaryotic Gene Expression
BCHM 610 – Syllabus
Spring 2017

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Office hours: Immediately following class or by appointment.

LECTURE TA: None
office:
TEL:
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Office hours:

COURSE OBJECTIVES

This course will provide students with a basic understanding of gene expression mechanisms with a specific focus on newly emerging topics. This course will be taught from primary literature, using a textbook as a background resource. Topics will include transcription, messenger RNA, microRNAs and connections between gene expression steps. Students will learn how to read, communicate, and interpret scientific literature through class presentations, discussions and take home assignments. Additionally, students will gain experience in developing and testing hypotheses and writing a research proposal.

LEARNING OUTCOMES

Basic knowledge of the molecular mechanisms in gene expression and regulation
An appreciation for post-transcriptional gene regulatory events
Enhancement of oral and written communication skills
Mastery of reading and interpreting scientific literature in gene expression fields
Development of critical thinking and creativity in scientific research

TEXTBOOK

Lewin's Genes XI, 11th ed.
Jocelyn E. Krebs, Stephen T. Kilpatrick, Elliott S. Goldstein, editors
ISBN 978-1-4495-5985-1
Jones and Bartlett Learning, LLC, an Ascend Learning Company, c. 2014

This textbook is recommended for this course especially if you have not been exposed to these topics and concepts. This book contains the necessary background information for

reading and interpreting primary literature. Students should read the appropriate chapters in this book prior to reading assigned papers.

Some of the material from this course may also be covered by reviews from the scientific literature. These are accessible free of change and electronically through the Purdue Library.

LECTURE TIME AND PLACE

Tuesdays and Thursdays 9:00-10:15 am
Biochemistry (BCHM) Room 102

BLACKBOARD

The syllabus for the course and lecture notes will be available via the Purdue University Blackboard site at: http://www.itap.purdue.edu/learning/tools/blackboard/

ASSESSMENT

IN CLASS ASSESSMENT/ASSIGNMENTS
Grades will be assessed based on attendance, class participation, presentations, homework, and written proposal. There will be multiple opportunities for students to present or discuss literature or topics on gene expression during this semester. Class participation points will be determined through engaged discussions, contribution to student presentations, asking relevant questions, etc. Students are responsible for reading material prior to class. Dr. Briggs will provide guidance regarding objectives for each reading assignment and key 'take home' messages or concepts.

HOMEWORK/MINI-PROPOSAL
During this course, students will learn to read and critically review publications in the gene expression field. Homework assignments will require reading and describing assigned papers, finding papers on select topics, and/or preparing PowerPoint presentations to give brief presentations. Students will be individually selected to present figures or discuss current topics. The final assignments involve original proposals where students will have the opportunity to design their own experimental goals and then evaluate the research ideas of their peers. The proposals should present a major question in the field, hypothesis and two aims (with two experiments per aim) to test this hypothesis.

The grading for this course will be as follows:

Class attendance/participation/homework	420	points (15 each)
“FISH" and "QTCR"	40	points (10 each)
Presentations	30	points (10 each)
Group Discussions	50	points (10 each)
Aims Outline	30	points
Introduction Outline	30	points
Mini-Proposal	150	points
Summary Statements	30	points
	780	total points

Class Participation and Attendance and Homework
100% attendance is necessary for all attendance points after the first week (28 classes). Attendance will be taken after the first week. Students must participate and contribute during the class period (must ask or answer a reasonable and/or thoughtful question during class). If students are not participating in class, attendance points will not be counted.

The cutoff values for letter grades are as follows:

702 points	A
624 points	B
546 points	C
468 points	D
390 points and below	F

Absence from class will count against your class participation grade unless the absence is excused by the instructor. Missing your class presentation will result in 0 points unless the absence is excused with reasonable justification. Any request to be excused from class must include **official documentation** (doctor's note, request from academic advisor, etc). Students are welcome to inform the instructor if they will be absent, but it will not be excused without a written note.

Student Presentations
All students will have opportunities to present in class. Presentations will be **randomly assigned** on the day of class. The presentation will consist of individual students describing a figure from an assigned paper and detailing the results. Students should read all of the papers before class to ensure that they are prepared if selected to present.

Late Work Policy
There is **no late work** accepted in this class. Final written documents are due by **the end of class** on the specified due date. **Late papers will receive a zero.**

If you have any disagreements with the way you have been graded, please consult the grading scale and then discuss them with the instructor.

EXTRA CREDIT

Extra credit will be at the discretion of the instructor.

OBTAINING EXTRA HELP

Dr. Briggs will be available to answer your questions immediately after class or by appointment (by e-mail).

ACADEMIC MISCONDUCT

Academic misconduct of any kind will not be tolerated in any course offered by the Department of Biochemistry. Assignments with evidence of academic misconduct will **receive zero credit**. The student will also be reported to the Dean of Student Affairs. Information on Purdue's policies with regard to academic misconduct can be found at http://www.purdue.edu/studentregulations/student_conduct/regulations.html

To provide you with an unambiguous definition of academic misconduct, the following text has been excerpted from "Academic Integrity: A Guide for Students", written by Stephen Akers, Ph.D., Executive Associate Dean of Students (1995, Revised 1999, 2003), and published by the Office of the Dean of Students in cooperation with Purdue

Student Government, Schleman Hall of Student Services, Room 207, 475 Stadium Mall Drive West Lafayette, IN 47907-2050.

“Purdue prohibits "dishonesty in connection with any University activity. Cheating, plagiarism, or knowingly furnishing false information to the University are examples of dishonesty." [Part 5, Section III-B-2-a, *Student Regulations*] Furthermore, the University Senate has stipulated that "the commitment of acts of cheating, lying, and deceit in any of their diverse forms (such as the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest." [University Senate Document 72-18, December 15, 1972]

More specifically, the following are a few examples of academic dishonesty, which have been discovered at Purdue University.

- substituting on an exam for another student
- substituting in a course for another student
- paying someone else to write a paper and submitting it as one's own work
- giving or receiving answers by use of signals during an exam
- copying with or without the other person's knowledge during an exam
- doing class assignments for someone else
- plagiarizing published material, class assignments, or lab reports
- turning in a paper that has been purchased from a commercial research firm or obtained from the internet
- padding items of a bibliography
- obtaining an unauthorized copy of a test in advance of its scheduled administration
- using unauthorized notes during an exam
- collaborating with other students on assignments when it is not allowed
- obtaining a test from the exam site, completing and submitting it later
- altering answers on a scored test and submitting it for a regrade
- accessing and altering grade records
- stealing class assignments from other students and submitting them as one's own
- fabricating data
- destroying or stealing the work of other students

Plagiarism is a special kind of academic dishonesty in which one person steals another person's ideas or words and falsely presents them as the plagiarist's own product. This is most likely to occur in the following ways:

- using the exact language of someone else without the use of quotation marks and without giving proper credit to the author
- presenting the sequence of ideas or arranging the material of someone else even though such is expressed in one's own words, without giving appropriate acknowledgment
- submitting a document written by someone else but representing it as one's own”

EMERGENCY PREPAREDNESS

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester

calendar or other circumstances. To get information about changes in this course consult the class Blackboard site or e-mail or phone the instructor.

If you are ill with flu-like symptoms, please do not attend class. Course materials will be provided to you.

LECTURE SCHEDULE

The format of this course is as follows:

Students are encouraged to seek assistance from Dr. Briggs with assignments and concepts. Students are responsible for reading all assigned chapters and papers prior to class.

Topic	**Lecture**	**Date**	**Lecture Focus**	**Homework Assignment**	**Corresponding Book Chapter(s)**	**Presenter/ Homework**
Introduction	1 - T	Jan 10	*Introduction to the course*	For Jan 17: Identify a model system and determine the pros, cons and nomenclature – prepare a PPT slide.		
	2 - Th	Jan 12	*Brief Overview of Central Dogma*	For Jan 19: Identify a tool/technique used for gene expression analysis - prepare a PPT slide.	Chapter 2 (Chapters 1&4 if needed)	
Molecular Biology	3 - T	Jan 17	*Model Systems and Databases*	Discuss model systems that students identified.		**Presentations (10 pts)**
	4 - Th	Jan 19	*Tools and Techniques*	Discuss tool/techniques used for gene expression analysis.	Chapter 3	**Presentations (10 pts)**
Computational Analysis	5 - T	Jan 24	**Guest Lecture: Dr. Nadia Atallah**	For Jan 31: Find your favorite Transcription factor – prepare a PPT slide.		
Genome Wide Technologies	6 -Th	Jan 26	**Guess Lecture: Dr. Majid Kazemian**	For Feb 2: assigned paper		

Eukaryotic Transcription	7 - T	Jan 31	*Cis-acting Transcriptional Elements and "How to read a scientific paper"* *Intro/Discussion: "FISH"* *Figures: "QTCR"*	Discuss Transcription factors that students identified. Find and Read Review: enhancers	Chapters 20 and 28.7	**Presentations (10 pts)**
	8 - Th	Feb 2	*"How to read a scientific paper" cont. and go over assigned paper*	Go over assigned paper with students This is the format students will have to bring to class.		**FISH-QTCR (10 pts)**
	9 - T	Feb 7	Enhancers	Find and Read Review: RNA pol II CTD	20.9-20.12 29.1, 29.7-29.8	**Group Discussion (10)**
Transcription Initiation	10 - Th	Feb 9	*Introduction into RNA Pol II*	For Feb 16: assigned paper		
	11 - T	Feb 14	*RNA Pol II CTD (promoter clearance and elongation)*	Find and Read Review: Histone Code	Chapters 20.7-20.8; 28	
	12 - Th	Feb 16		FISH" and "QTCR" of assigned paper		**FISH-QTCR (10 pts)**
Histone modifications and the genome	13 - T	Feb 21	*"Histone Code"*	Find and Read Review: aberrant transcripts	Chapters 28.8-28.13; 29; 10.1-10.5	

	14 - Th	Feb 23	*Histone Code Readers*	For Mar 2: assigned paper “James Bradner”		
Cryptic transcription	15 - T	Feb 28	*Aberrant Transcripts*	Find and Read Review: ncRNA For Mar 9: Identify paper for group discussion	Chapters 22.1-22.3; 22.8; 22.10 and 30.3	
	16 - Th	Mar 2		“FISH" and "QTCR" of assigned paper		**FISH-QTCR (10 pts)**
	17 - T	Mar 7	lncRNA	Group paper Discussion		**Group Discussion (10 pts)**
	18 - Th	Mar 9		**Discussion of Final Project Graph and Outline Handouts** Find and Read Review: *Termination or 3' end formation*	Open Discussion	
No Class		**Mar 13 & 18**	**SPRING BREAK**			
mRNA Processing	19 - T	Mar 21	*Termination, 3' end formation and splicing*		Chapter 21	
	20 - Th	Mar 23	**In class group workshop**	**Discussion of specific aims** Find and Read Review: *RNA transport*	Open discussion.	

	21 - T	Mar 28	**In class group workshop**	**Discussion of specific aims** For Apr 4: assigned paper	Open discussion.	
Nuclear Transport	22 - Th	Mar 30	*RNA transport*	**Hypothesis and Aims Graphical Outline Due** Find and Read Review: *mRNA stability*		**Hypothesis and Aims Graphical Outline Due (30 pts)**
	23 - T	Apr 4		FISH" and "QTCR" of assigned paper For Apr 11: Identify paper for group discussion		**FISH-QTCR (10 pt**s)
Translation and mRNA stability	24- Th	Apr 6	*Translation and mRNA stability*	**Introduction Outline Due (fully referenced)**	Chapters 24; 22.5-22.9	**Introduction Outline Due (30 pts)**
	25 - T	Apr 11		Group paper Discussion		**Group Discussion (10 pts)**
Regulatory RNAs	26 - Th	Apr 13	Trans-acting RNAs	Find and Read Review: P Bodies	Chapters 22.6; 30.5-30.8	
	27 - T	Apr 18	No class – Work on proposal	Work on proposal For Apr 25: Identify paper for group discussion		

	28 - Th	Apr 20	*P Bodies*	**Mini-proposals due.**	Chapter 22.10	**Group Discussion (10 pts)** **Min-proposal Due (150 pts)**
	29 - T	Apr 25		Group paper discussion **Write Summary Statement**		**Group Discussion (10 pts)**
	30- Th	Apr 27	*graduate student success*	**Summary statement due**		**Summary Statement Due (30 pts)**
	No Lecture	**May 1-6**	**Finals week:**	**No Class and no exam**		